

TO: Distribution

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SUBJECT: Revision of MOSN-141 (Use of Dynamic Reconfiguration in Multics)

This MOSN obsoletes MOSN-158.

1. Multics now has a full capability for dynamic reconfiguration of processors and memories. This will make it possible for operations to add or remove any processor and any memory except the bootload (i.e., the low order) memory while the system is running. There must, of course, be a minimum of one processor, and one memory for each processor. The reconfiguration commands can be issued from the initializer console or any daemon process at Multics command level (or in "admin" mode).

2. The following is a sample console output for adding a processor:

```
addcpu b 5
```

Check that the following has been done (if not, do it in the following order):

```
cpu b must be initialized (*Turn to Page 5 for new instructions).
```

```
All memories: PORT ENABLE (port 5) set to MASK
cpu b must have the following switch setting:
  clock a:      Port Block 5          Interlace OFF
  memory c:     Port Block 0          Interlace OFF
  memory d:     Port Block 1          Interlace OFF
  memory e:     Port Block 2          Interlace OFF
CPU NO: 2
```

Have all the above been done? (yes/no and initials): yes rrs

You will change CONTROL PROCESSOR switch on memory d to port 5 (cpu b).

Wait until instructed to change it. Are you ready? (yes/no): yes

Change switch now. Type 'yes' when done: yes

cpu b is now running.

The arguments to the addcpu command are the processor name (e.g., "b") and the processor port (e.g., "5") as on the BOS configuration card. An additional argument can optionally be provided to specify a particular memory controller (e.g., "b") to be given the added CPU as its control processor. Be certain that when the new CPU is being readied, the various switches are set in the order listed: check very carefully, as wrong switches can crash the system.

3. The command for removing a processor is of the form delcpu b. The sequence of instructions (as for adding a CPU) for changing the control processor switch will be given for each controller assigned to the CPU being removed.

4. The following is a sample console output for adding a memory:

```
addmem e
```

```
Perform the following (in the order given) on memory controller e.
```

```
PORT ENABLE set to OFF for all ports.
```

```
Initialize controller at its maintenance panel.
```

```
Change CONTROL PROCESSOR switch to port 4 (cpu a).
```

```
PORT ENABLE set to MASK for ports 0, 3 and 4.
```

```
Have all the above been done?(yes/no and initials): yes rrs
```

```
You have added memory controller e.
```

The argument to the addmem command is the memory name (e.g., c) as on the BOS configuration card. An additional argument can optionally be provided to specify a particular cpu (e.g., a) as the control processor for the memory being added.

Be certain that when the new memory is being readied, the various switches are set in the order listed. In order to initialize the controller at its maintenance panel, the controller must be in the test mode using the test switch. While in the test mode, press the initialize button. Then set the controller from the test mode to

the operate mode.

5. The command for removing a memory is of the form delmem e. If this is the only memory whose control processor switch is directed to some processor, then the operator will be given the sequence of instructions (as for adding a processor) for changing the control processor switch on some other memory to this processor.
6. When the reconfiguration commands request the operator to give a "yes/no" answer, then any answer other than yes will properly terminate the reconfiguration. When the operator is asked for a "yes" answer, he must do as directed and answer "yes" or risk crashing the system. If the error message "program error--notify programmer" ever occurs, DO NOT try to use ANY reconfiguration command again until cleared by a programmer, or until the next bootload of the system.
7. Note that when the configuration is changed dynamically, the BOS cards for processors and memories may no longer reflect the true configuration. Therefore, before the next bootload or salvage, the hardware configuration and the BOS configuration deck must be made consistent with each other.
8. Only memories that are defined by BOS cards at bootload time can be added. The configuration card for a memory has a field to indicate if it is on-line or off-line. All the memories actually being used at the time of the bootload must have an "ON" in the last field on the BOS configuration card. These memories should be the first in the configuration deck. Memories which might be added later have an "OFF" in the field. These should follow the other memory cards (i.e., these

are the high-order memories). Normally, in the service machine BOS deck there should be a memory card (either "ON" or "OFF") for every memory in the installation. When the service system is bootloaded, it is essential that all processors, drums, and GIOC's have the port block switches set up for all memories in the BOS deck, including the off-line memories--if not done for a memory at bootload time, the system will crash when attempting to add the memory. On the development system controllers it is essential that the ports for all service system modules be set to "OFF" and that the control processor switch never be set to a service system processor. Failure by anyone--including field engineers and programmers--to observe these constraints will allow the development system to crash the service system. Note that when a processor is added, it becomes part of the service machine and so any development memory ports must be changed to "OFF" for the added processor BEFORE giving the command to add the processor.

9. The PORT ENABLE switches for all memory controllers running on the service system should be set in the "MASK", i.e., "IN LINE", position for all ports at all times. For the development system, all ports should be "ON" or "OFF" to reflect the running configuration. Note that after adding a memory, unused ports are left in the "OFF" position. After the adding of the memory is completed the operator will put ALL mask switches in the IN-LINE position.

10. When moving the processor and memory from the development to the service system, the changing of switches by the operator can be minimized by using the following sequence. If the development system has a processor P with port X and a memory M, then to move these to the service system give the following commands in this order.

```
addmem M
addecpu P X M
```

When removing a processor and memory from the service system to form a development system, changing of switches is minimized by removing the non-bootload processor and the high order memory using the following commands in this order:

```
delcpu P
delmem M
```

#### addecpu Instruction

1. Put processor in PROG.
2. Open Pro. door and set switches as outlined on the console.
3. Close Pro. door and depress "initialize" switch.
4. Turn "PROG." switch to OFF.
5. Press "step" button once.
6. Turn select 1 dial to LW1-LW2 and check Inst. for 616 (DIS).
7. If 616, return to console and continue.
8. If NO 616, depress "initialize" switch again.
9. If 616 does not show report this to F.E.'s and software support.
10. Terminate addecpu command by "no", line space or carriage return.